

1      **CLAIMS**

2

3      1. A method comprising:  
4           generating an edge map from scanned image data; and  
5           analyzing the edge map to determine a plurality of boundaries; and  
6           evaluating the boundaries based on a set of rules to identify a plurality of  
7        objects.

8

9      2. A method as recited in claim 1, wherein the analyzing further  
10        comprises taking a Hough transform of the scanned image to determine the  
11        boundaries.

12

13     3. A method as recited in claim 1, wherein a first object of the objects is  
14        aligned with respect to another object of the objects.

15

16     4. A method as recited in claim 1, wherein at least one subset of the  
17        objects are rectangular in shape.

18

19     5. A method as recited in claim 1, wherein at least one subset of the  
20        plurality of objects are photographs.

21

22     6. A computer readable medium comprising computer-executable  
23        instructions to perform a method as recited in claim 1.

1       7. A method for detecting one or more objects in image data, the  
2 method comprising:

3             generating an edge map from the image data; and  
4             analyzing the edge map to determine a plurality of boundaries of the one or  
5 more objects.

6

7       8. A method as recited in claim 7, wherein the one or more objects are  
8 photographs.

9

10     9. A method as recited in claim 7, wherein the one or more objects are  
11 rectangular in shape.

12

13     10. A method as recited in claim 7, further comprising segmenting the  
14 one or more objects based on the set of boundaries.

15

16     11. A method as recited in claim 7, wherein the edge map comprises an  
17 array of elements, each element representing a respective pixel of the image data;  
18 and

19             wherein the generating further comprises:

20                 estimating a background color of a scanner lid;

21                 for each pixel of at least one subset of the image data:

22                     identifying an absolute difference between a value of a  
23 current pixel and the background color; and

if the absolute difference is greater than a predetermined threshold, indicating that a corresponding array element represents a pixel of the at least one subset of image data that belongs to an edge.

12. A method as recited in claim 7:

wherein the edge map comprises an array of elements, each element representing a respective pixel of the image data;

wherein the analyzing further comprises:

transforming the array of elements to produce a set of domain peaks, each domain peak corresponding to a straight line of a set of straight lines; and

determining which of the straight lines belong to the set of boundaries based on a set of rules.

**13.** A method as recited in claim 12, wherein the determining further comprises:

identifying a boundary set that indicates an object at a distinct angle as compared to an orientation of a previously found object;

identifying a boundary set that indicates an object having a same dimension as a previously found object; and

identifying pairs of parallel and perpendicular boundaries that indicate an object that satisfies a substantially non-background interior condition with a previously found object.

1           **14.** A method as recited in claim 12:

2           wherein the edge map comprises an array of elements, each element  
3 representing a respective pixel of the image data; and

4           wherein the transforming further comprises taking a Hough transform of  
5 the array of elements to produce the set of domain peaks.

6  
7           **15.** A method as recited in claim 7:

8           wherein the edge map comprises an array of elements, each element  
9 representing a respective pixel of the image data;

10          wherein the analyzing further comprises:

11           transforming the array elements to produce a set of domain peaks,  
12 each domain peak corresponding to a straight line of a set of straight lines; and

13           determining which of the straight lines belong to the set of  
14 boundaries based on a set of rules, the set of rules comprising rules that are  
15 directed to:

16           identifying a first object with a first dimension; and

17           seeking a same sized object with a second dimension that  
18 corresponds to the first dimension

19  
20          **16.** A method as recited by claim 15, wherein the identifying comprises:

21           determining a background color;

22           determining a candidate object; and

23           if an interior portion of the candidate object is not consistent with the  
24 background color, concluding that the candidate object is the first object.

1       **17.** A method as recited in claim 15, wherein a line of the straight lines  
2 corresponds to a candidate object, the seeking further comprising:

3             detecting a first image to background transition that corresponds to the first  
4 image, and a second image to background transition that corresponds to the line;  
5 and

6             if the first image to background transition does not coincide with the second  
7 image to background transition, assigning the line to be a boundary of a different  
8 object.

9  
10      **18.** A computer readable medium comprising a computer program  
11 configured to perform a method as recited in claim 1.

12  
13      **19.** A method for detecting whether image data represents more than  
14 one object, the method comprising:

15             determining a background color of a scanner lid;

16             identifying a set of transitions between the background color and other  
17 colors that correspond to the image data; and

18             analyzing the set of transitions to detect a set of image data characteristics;

19             estimating based on a set of one or more rules, a number of objects based  
20 on the set of image data characteristics.

21  
22      **20.** A method as recited in claim 19, wherein the objects are rectangular  
23 in shape.

1       **21.** A method as recited in claim 19, wherein the image data is scanned  
2 preview image data.

3

4       **22.** A method as recited in claim 19, wherein the analyzing further  
5 comprises taking a Hough transform of the set of transitions to detect the set of  
6 image data characteristics.

7

8       **23.** A method as recited in claim 19, further comprising:  
9           calculating a set of boundaries that delineate the objects based on the set of  
10 image data characteristics; and  
11           segmenting the objects from the image data based on the set of boundaries.

12

13       **24.** A method as recited in claim 19, wherein the identifying further  
14 comprises:

15           for each row(i) of image data:

16              calculating a left(i) transition from background data to image data;

17              calculating a right(i) transition from image data to background data;

18              determining a difference(i) between right(i) transition and left(i)  
19 transition;

20           for each column(j) of image data:

21              calculating a top(j) transition from background data to image data;

22              calculating a bottom(j) transition from image data to background  
23 data;

24              determine a difference(j) between bottom(j) transition and top(j)  
25 transition;

1 generating a first histogram from each difference(i);  
2 generating a second histogram from each difference(j); and  
3 using a set of characteristics that are displayed by the first and second  
4 histograms display to determine whether the image data represents one objects or  
5 more than one object.

6

7 25. A method as recited in claim 19, further comprising:

8 generating a first histogram representing horizontal transitions from the  
9 transitions;

10 generating a second histogram representing vertical transitions from the  
11 transitions;

12 the first and second histograms displaying a set of peaks that identify  
13 whether the image data comprises more than one object; and

14 the set of rules comprising the following rules:

15 (a) if the set of peaks comprises only a single peak, classifying the  
16 image data as containing only a single object;

17 (b) if the set of peaks comprises only two peaks, classifying the  
18 image data as containing multiple objects;

19 (c) classifying the image data as comprising multiple objects if there  
20 is a gap in either the first histogram or the second histogram; and

21 (d) if neither (a), (b), or (c) apply, classifying the image data as  
22 comprising multiple objects.

1           **26.** One or more computer-readable media containing a computer  
2 executable program that performs a method as recited in claim 19.  
3

4           **27.** A device for detecting multiple objects in image data, the device  
5 comprising:  
6

7                 a processor configured to execute computer program instructions for:  
8

9                     generating an edge map from the image data;  
10

11                     analyzing the edge map to determine a set of boundaries of the one  
12 or more objects; and  
13

14                     segmenting the one or more objects based on the set of boundaries.  
15

16           **28.** A device as recited in claim 27, wherein the analyzing further  
17 comprises taking a Hough transform of the edge map to determine the set of  
18 boundaries.  
19

20           **29.** A device as recited in claim 27, wherein the analyzing further  
21 comprises:  
22

23                 determining a set of transitions between the set of boundaries and a  
24 background color;  
25

26                 identifying a set of characteristics from the set of transitions, the set of  
27 characteristics being used to indicate whether the image data comprises a single  
28 object or whether the image data comprises a plurality of objects; and  
29

30                 if the image data corresponds to a plurality of objects, assigning particular  
31 ones of the set of boundaries to particular ones of the plurality of objects based  
32 on a set of rules.  
33

1  
2       **30.** A device as recited in claim 29, wherein the set of rules comprises  
3 rules that are directed to:

4              determining a background color of a scanner lid;

5              determining a candidate object;

6              determining that the candidate object is a first object, the first object  
7 having a first dimension if an interior portion of the candidate object is not  
8 consistent with the background color; and

9              seeking a same sized object with a second dimension that  
10 corresponds to the first dimension.

11  
12       **31.** A device as recited in claim 29, wherein the set of rules comprises  
13 rules that are directed to:

14              determining a background color of a scanner lid;

15              determining a first candidate object;

16              if an interior portion of the first candidate object is not consistent  
17 with the background color, determining that the first candidate object is a first  
18 object, the first object having a first dimension; and

19              seeking a same sized object with a second dimension that  
20 corresponds to the first dimension, the seeking comprising:

21              identifying a boundary of the set of boundaries that  
22 corresponds to a second candidate object;

23              detecting a first image to background transition that  
24 corresponds to the first object, and a second image to background transition that  
25 corresponds to the boundary; and

1           if the first image to background transition does not coincide with the second  
2       image to background transition, assigning the boundary to the same sized object.

3  
4       **32.** A device as recited in claim 29, wherein the identifying further  
5       comprises:

6           for each row(i) of image data:

7               calculating a left(i) transition from background data to image data;

8               calculating a right(i) transition from image data to background data;

9               determine a difference(i) between right(i) transition and left(i)  
10          transition;

11          for each column(j) of image data:

12               calculating a top(j) transition from background data to image data;

13               calculating a bottom(j) transition from image data to background  
14          data;

15               determine a difference(j) between bottom(j) transition and top(i)  
16          transition;

17          generating a first histogram from each difference(i);

18          generating a second histogram from each difference(j); and

19          wherein the first and second histograms display the set of characteristics.

1           **33.** A device as recited in claim 29, wherein the set of rules is a first set  
2 of rules, and wherein the set of characteristics indicate a set of peaks that are used  
3 to identify whether the image data comprises a single object or a plurality of  
4 objects based on a second set of rules, the second set of rules comprising rules that  
5 are directed to:

- 6                 (a) if the set of peaks comprises only a single peak, classifying the  
7 image data as containing only a single object;
- 8                 (b) if the set of peaks comprises only two peaks, classifying the  
9 image data as containing a plurality of objects;
- 10                 (c) if there is a gap in either the first histogram or the second  
11 histogram, then classifying the image data as comprising containing a  
12 plurality of objects; and
- 13                 (d) if neither (a), (b), or (c) apply, classifying the image data as  
14 comprising containing a plurality of objects.

15  
16           **34.** A computer readable storage medium comprising a program module  
17 for detecting multiple objects in image data, wherein the program module  
18 performs acts comprising:

19                 generating an edge map from the image data; and  
20                 analyzing the edge map to determine a set of boundaries of the one or more  
21 objects.

22  
23           **35.** A computer readable storage medium as recited in claim 34,  
24 wherein the one or more objects are photographs.

1           **36.** A computer readable storage medium as recited in claim 34,  
2 wherein the one or more objects are rectangular in shape.

3  
4           **37.** A computer readable storage medium as recited in claim 34,  
5 wherein the program module further performs acts comprising segmenting the one  
6 or more objects based on the set of boundaries.

7  
8           **38.** A computer readable storage medium as recited in claim 34,  
9 wherein the edge map comprises an array of elements, each element representing a  
10 respective pixel of the image data; and

11           wherein the generating further comprises:

12                 estimating a background color of a scanner lid;

13                 for each pixel of the image data:

14                         identifying an absolute difference between a value of the  
15 pixel and the background color; and

16                         if the absolute difference is greater than a predetermined  
17 threshold, indicating that a corresponding array element represents a pixel of the  
18 image data that belongs to an edge.

19  
20           **39.** A computer readable storage medium as recited in claim 34,  
21 wherein the analyzing further comprises:

22                 transforming the array elements to produce a set of domain peaks, each  
23 domain peak corresponding to a straight line of a set of straight lines; and

24                 determining which of the straight lines belong to the set of boundaries  
25 based on a set of rules.

1  
2       **40.** A computer readable storage medium as recited in claim 39,  
3 wherein the transforming further comprises taking a Hough transform of the array  
4 of elements to produce the set of domain peaks.

5  
6       **41.** A computer readable storage medium as recited in claim 34,  
7 wherein the analyzing further comprises:

8              transforming the array elements to produce a set of domain peaks, each  
9 domain peak corresponding to a straight line of a set of straight lines; and

10             determining which of the straight lines belong to the set of boundaries  
11 based on a set of rules, the set of rules comprising rules that are directed to:

12                 identifying a first object with a first dimension; and

13                 seeking a same sized object with a second dimension that  
14 corresponds to the first dimension.

15  
16       **42.** A computer readable storage medium as recited in claim 41,  
17 wherein the identifying comprises:

18             determining a background color of a scanner lid;

19             determining a candidate object; and

20             if an interior portion of the candidate object is not consistent with the  
21 background color, concluding that the candidate object is the first object.

1           **43.** A computer readable storage medium as recited in claim 41,  
2 wherein a line of the straight lines corresponds to a candidate object, the seeking  
3 further comprising:

4           detecting a first image to background transition that corresponds to the first  
5 image, and a second image to background transition that corresponds to the line;  
6 and

7           if the first image to background transition does not coincide with the second  
8 image to background transition, assigning the line to be a boundary of a different  
9 object.

10           **44.** A computer comprising one or more computer-readable media as  
11 recited in claim 34.